Cretaceous brachiopods from northern Zululand

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Synopsis

Brachiopod specimens collected from Upper Aptian and Albian localities in northern Zululand by W. J. Kennedy and H. C. Klinger are described and their systematic position reviewed in the light of the latest stratigraphical data. Descriptions are given for two new rhynchonellid species, *Cyclothyris africana* and *C. kennedyi*, as well as a new dallinoid brachiopod, *Dzirulina haughtoni*. A lectotype is selected for *Terebratula vanhoepeni* Lang, which is assigned to *Praelongithyris*, and a new species of *Cyrtothyris* is described as *C. ndumuensis*.

Introduction

Kennedy & Klinger (1975) published an account of the stratigraphy of the main Cretaceous outcrops of Zululand and Natal, South Africa in which they proposed the term *Zululand Group* to cover the succession from Upper Barremian to Maastrichtian equivalents. One member of the group, the Mzinene Formation, represents the European equivalent of Albian to Cenomanian rocks and contains a mixed invertebrate fauna of bivalves, gastropods, echinoids, nautiloids, bryozoans, corals and brachiopods. Some brachiopods were collected during the summer expeditions of 1970–71 and these, together with material previously collected by Dr S. H. Haughton and L. N. J. Engelbrecht and now in the collections of the Geological Survey of South Africa, Pretoria, form the subject of the present paper.

The locality and stratigraphical details supplied with the Haughton and Engelbrecht collections is, by present-day standards, somewhat inadequate but a fair match has been possible by comparison with more recently-collected material.

In general, the brachiopod species described here bear a strong resemblance to specimens described and figured by Mme S. Fabre (Fabre *in* Collignon 1949, 1950) from the Albian of Madagascar and are chiefly from northern and northeastern Zululand. While it has been possible to compare external morphologies of some of the terebratulids and rhynchonellids described and figured by Fabre, no material has become available for comparison of internal structures. The transverse serial sections shown here, Figs 1, 2, 4, 6, are taken mainly from duplicate specimens in the Haughton and Engelbrecht collections together with specimens more recently collected by Dr W. J. Kennedy.

Systematic descriptions

Family **TEREBRATULIDAE** Gray, 1840

Subfamily **RECTITHYRIDINAE** Muir-Wood, 1965

Genus ***PRAELONGITHYRIS*** Middlemiss, 1959

Praelongithyris vanhoepeni (Lang)
Figs 1, 8a–c, 9a–c

1937 *Terebratula Van Hoepeni* Lang : 206; pl. 9, figs 13a–f.

EMENDED DESCRIPTION. *Praelongithyris* 25·1 mm long, 23 mm wide and 14·6 mm thick. A short, massive, suberect umbo is truncated by a large circular foramen with a well-developed pedicle

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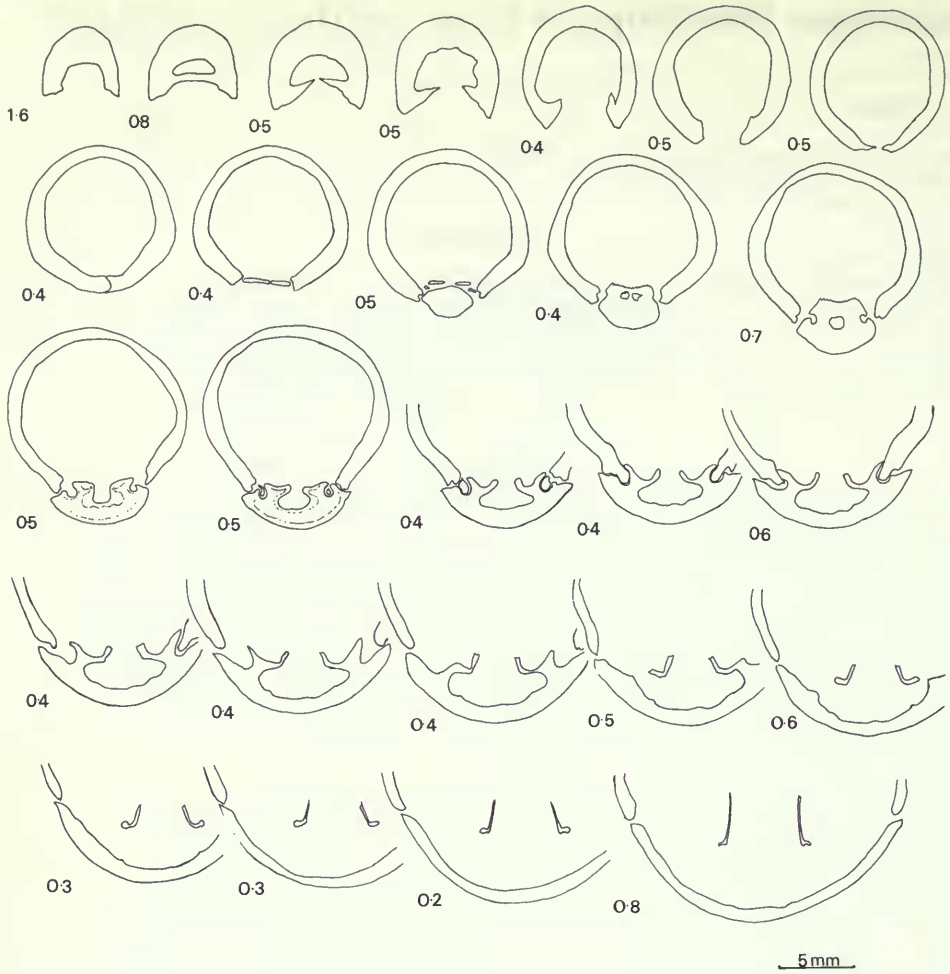


Fig. 1 *Praelongithyris vanhoepeni* (Lang). 26 transverse serial sections through the umbo of a specimen from the Upper Albian, Mzinene Formation, Munywana Creek, northern Zululand. ×2.

collar. Well-defined permesothyridid beak-ridges border a triangular interarea, exposing conjunct deltidial plates. The shell outline is elongate-oval with maximum width at about half the length of the shell. The lateral commissure is acutely deflected ventrally at the anterior end of the shell. The anterior commissure varies from biplicate to sulciplicate, the majority of variants being acutely biplicate. Numerous well-defined concentric growth-lines on the shell surface become closer or more lamellose anteriorly. A faint longitudinal ornament of imbricated striae radiate from the umbonal area of each valve, becoming a little more distinct towards the margins.

Internal characters. The series of 26 transverse serial sections through the umbo of a duplicate specimen of *P. vanhoepeni* shown here (Fig. 1) confirms the assignment of this species to the genus *Praelongithyris*. This is also the opinion of the author of the genus, Dr F. A. Middlemiss (personal communication).

The sections show the characteristic circular transverse outline of the shell cavity, small but thickened cardinal process, virgate and clubbed hinge-plates and extensive or elongated crural processes.

LECTOTYPE. In his original description of the species under the name *Terebratula Van Hoepeni*, Lang (1937 : 206) did not designate a type specimen but mentioned two examples, one of which

he figured (pl. 9, figs 13a–f) from the Albian of Ndabana-Umsinene. This specimen, which is here selected as lectotype of the species, was stated to be part of the Stefanini Collection which is in the Istituto Geologico, Universita di Pisa, Italy. The second specimen was said to belong to the Gortani Collection.

MATERIAL AND LOCALITY. Apart from the two specimens already mentioned, nine more were collected from beds considered to be of Upper Albian age, Mzinene Formation at the river cliff, south side of the main southern tributary of Munywana Creek, 1·5 km ESE of the farm Izwehelia, 27°51′36″S, 32°19′41″E (Loc. 64, Kennedy & Klinger 1975 : 289); BM(NH) Palaeontology Dept. BB 81000–8. Two of these are figured here as Figs 8–9.

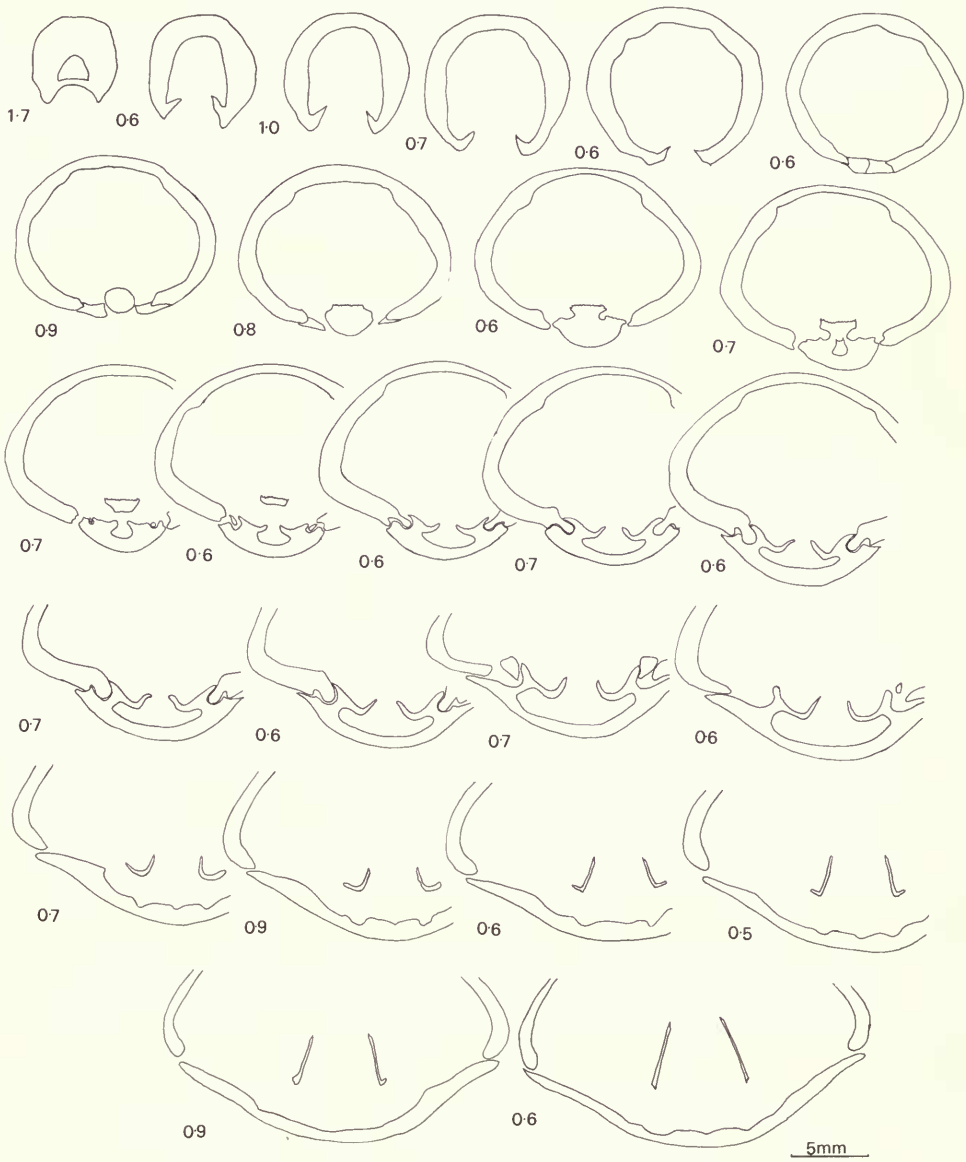


Fig. 2 *Cyrtothyris ndumuensis* sp. nov. 25 transverse serial sections through the umbo of a specimen from the Upper Albian, Mzinene Formation, Ndumu, northern Zululand. ×2.

Remarks. Fabre (*in* Collignon 1950 : 27; pl. 3, figs 13a–c, 14, 14a) described two Malagasy terebratulids as *Terebratula sella* Sowerby. These specimens show a remarkable similarity to the specimens from Zululand. Although the internal structures of Fabre's specimens are unknown, it seems clear from the external morphology that the specimens which she figured can be assigned to the genus *Praelongithyris*. Furthermore, in her description of the species (1950 : 27), she states that the shell surface has an ornament of fine striae which are clearly visible, a point emphasized by Lang (1937) in his original description of *Terebratula Van Hoepeni* and also noted on examples figured here.

Apart from the occurrence of *Praelongithyris vanhoepeni* in Zululand and possibly in Madagascar, specimens externally similar have been collected, from beds of Upper or Lower Albian age at Kara Bair Dagh, Khorassan, northern Iran, by the Amiranian Oil Company; these were donated to the BM(NH).

Muir-Wood (1953) described and figured a single terebratulid from the Skoenberg Beds, Cenomanian, of Munywana Creek, Zululand, naming the species *manuanensis* and leaving it broadly assigned to *Terebratula*, believing it unrelated to *T. Van Hoepeni* Lang, and pointing out the differences in external morphology which she considered distinguished the two species. In her description of '*Terebratula*' *manuanensis* she mentioned the presence of longitudinal striae on the shell surface, a character which also occurs in *T. Van Hoepeni*. Unfortunately no further material which can be identified as '*T.*' *manuanensis* has since come to light and so the internal characters are still unknown. It is hoped that material will become available for serial sectioning before long.

Genus *CYRTOTHYRIS* Middlemiss, 1959

Cyrtothyris ndumuensis sp. nov.

Figs 2, 10a–c, 11a–c, 12a–c, 13a–c

Description. *Cyrtothyris* elongate-oval to subcircular in general outline. Almost evenly biconvex. Umbo broad, massive, suberect. Foramen large, circular, labiate. Extensive triangular interarea flanked by sharp or clearly-defined mesothyridid beak-ridges. Small, well-exposed symphytium. Shell surface smooth but with well-marked concentric growth-lines, more prominent at the margins. Lateral commissure almost straight. Anterior commissure uniplicate to moderately biplicate.

Internal characters. A series of 25 transverse serial sections (Fig. 2) through the umbo of a duplicate specimen from the type locality show a well-developed pedicle collar, the small, flat cardinal process becoming larger with secondary thickening. Virgate hinge-plates develop anteriorly with extensive inner and outer socket ridges. Long, inwardly-deflected crural processes give rise to strong crural flanges which diminish anteriorly as the brachial loop assumes a broad triangular shape. Transverse band not seen.

Holotype. The specimen figured here, Fig. 11, from the Mzinene Formation, Upper Albian, 5·5 km SE of the store at Ndumu, northern Zululand. Geological Survey of South Africa Collection. Dimensions, length 29·5 mm, breadth 23·0 mm and thickness 16·9 mm.

Material and localities. In addition to the holotype, there are the two specimens shown in Figs 12–13 and six others from the same horizon and locality. Three specimens (Fig. 10) considered to be variants are from the low slopes on the western end of Mzinene Pan, also from the Mzinene Formation of Albian age.

Remarks. *Cyrtothyris ndumuensis* sp. nov. bears a strong resemblance to terebratulid brachiopods figured by Fabre (*in* Collignon 1949 : 11; pl. 1, figs 13a–c, 14, 14a), who briefly described specimens from the Albian of Madagascar as *Terebratula subrotunda* Sowerby. She points out the extreme variability of the species and compares it to a rotund terebratulid described by Stoliczka (1872 : 23; pl. 6, figs 17–23) as *T. subrotunda* Sowerby from the Middle Cretaceous, Trichinopoly Beds of Arialoor, southern India. She mistakenly attributes the variety *subundata* to Stoliczka.

Fig. 3 *Dzirulina haughtoni* sp. nov., from the Upper Aptian, Mfongosi Spruit, northern Zululand. **Holotype.** a, dorsal view. b, anterior view. c, lateral view. ×2. Geological Survey of South Africa coll.

Superfamily **DALLINOIDEA** Beecher, 1893

Family **KINGENIDAE** Elliott, 1948
[*nom. transl.* Owen, 1970]

Subfamily **KINGENINAE** Elliott, 1948

Genus ***DZIRULINA*** Noutsoubidze, 1945

Dzirulina haughtoni sp. nov.
Figs 3, 4

DESCRIPTION. *Dzirulina* 20·5 mm long, 19·8 mm wide and 11 mm in thickness. Evenly biconvex, almost circular in general outline. Broad, massive umbo, well-developed and slightly produced. Beak suberect, beak-ridges sharp, permesothyridid, defining an extensive interarea with well-exposed deltidium and moderately large, circular foramen. Shell surface without ornament except well-marked, evenly spaced concentric growth-lines. Faint longitudinal radiating striae are seen on exposed parts of secondary shell.

Internal characters. From the 19 transverse serial sections (Fig. 4) prepared from a duplicate specimen identified as *Dzirulina haughtoni* from the type locality and horizon it is seen that no cardinal process is developed. Comparatively short, divergent dental lamellae support elongate, peg-like hinge-teeth. The broad, flattened hinge-trough has a central depression or shallow groove which is deeper towards the anterior end of the trough at the point of attachment with the supporting high, well-developed median septum. The descending branches of the brachial loop develop elongate, inwardly curving crural processes and diminish rapidly anteriorly. There is no attachment of descending branches of the loop to the median septum. The conical kingeniform hood is developed from the ascending branches which form an acute Y-shaped angle at the point of attachment to the median septum, approximately mid-way along the septal pillar.

NAME. For Dr S. H. Haughton.

HOLOTYPE. A specimen (Fig. 3) selected from four poorly-preserved but almost whole examples in the Engelbrecht Collection. From Haughton's locality Z2, Mfongosi Spruit, from bluffs along the ridge on the north side of the stream, 700–1200 m ESE of the old drift, 27°21′43″S, 32°09′25″E (Loc. 168; Kennedy & Klinger 1975 : 302).

HORIZON. Haughton (1936 : 301) considered the above locality to have yielded bivalvia of Neocomian age, but there is insufficient ammonite evidence to support his views. He based his assumption on the occurrence of two indigenous bivalves, *Trigonia pongolensis* and *Cardium rogersi*. Kennedy & Klinger (1975 : 301) have suggested an Upper Aptian age for the same section.

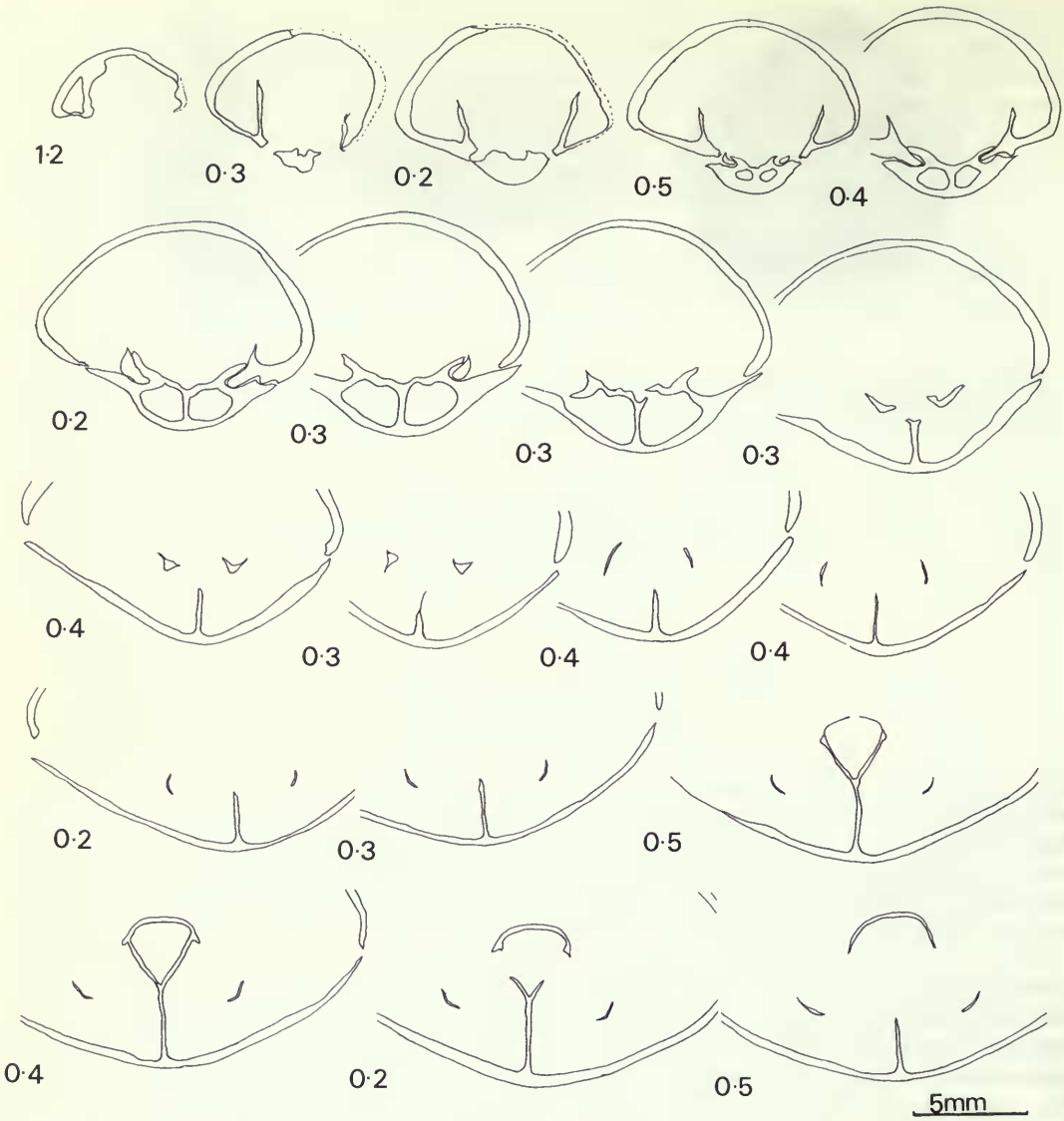


Fig. 4 *Dzirulina haughtoni* sp. nov. 19 transverse serial sections through a specimen from the Upper Aptian of Mfongosi Spruit, northern Zululand. ×3.

REMARKS. Noutsoubidze (1945 : 186) based *Dzirulina* on the Aptian species *Terebratula dzirulensis* Anthula from western Georgia, but was not able to illustrate or describe the internal structures of the type species. In a revision of the genus *Dzirulina*, Kvakhadze (1972) was able to show a series of transverse serial sections through a specimen of *D. dzirulensis* from the type locality, which shows it to be a senior synonym of *Belothyris* Smirnova (1960 : 114), described from the Lower Cretaceous of Beloya, north-western Caucasus. Representative species of this genus are not uncommon in beds of Hauterivian and Barremian age in central and western Europe. Owen (1970) recorded *Belothyris pseudojurensis* (Leymerie) from Hauterivian Beds in Switzerland and eastern France and described a species, *B. nettletonensis*, from beds of possible Hauterivian age at Nettleton, Lincolnshire, England.

Kvakhadze (1972) described a new species under the name *Dzirulina elliptica* from the Barremian of Tskaltsitela River, Kutaisi, Georgia, and this bears a very strong resemblance in

shell convexity, general outline and umbonal characters to *D. haughtoni*. The series of transverse serial sections given in Kvakhadze (1972 : fig. 4) accord favourably with those shown here (Fig. 4) for *D. haughtoni*. They are also identical to a series recently made from a specimen of an undescribed species from the ?Aptian of Pezu, Pakistan, now in the BM(NH).

Superfamily **RHYNCHONELLACEA** Gray, 1848

Family **RHYNCHONELLIDAE** Gray, 1848

Subfamily **CYCLOTHYRIDINAE** Makridin, 1955

Genus ***CYCLOTHYRIS*** M'Coy, 1844

Cyclothyris africana sp. nov.
Figs 5, 6

1950 *Rhynchonella sulcata* Dav. var. *paludensis* Jacob & Fallot; Fabre *in* Collignon: pl. 3, figs 11, 11a–c.

DIAGNOSIS. *Cyclothyris c.* 15·1 mm long 19·1 mm wide and 10·9 mm thick. Biconvex, oval in general outline, umbo short, beak suberect, foramen small. Beak-ridges indistinct, interarea short. Brachial valve with acute posterior umbonal inflation and broad, almost imperceptible fold. Pedicle valve with wide, shallow sulcus and trapezoidal linguiform extension.

DESCRIPTION. Both valves are ornamented by *c.* 35–40 fine radiating costae, originating as very fine costellae in the umbonal regions and becoming progressively distinct and more deeply incised towards the shell margins. A low median septum is just visible in the brachial umbo of better-preserved examples.

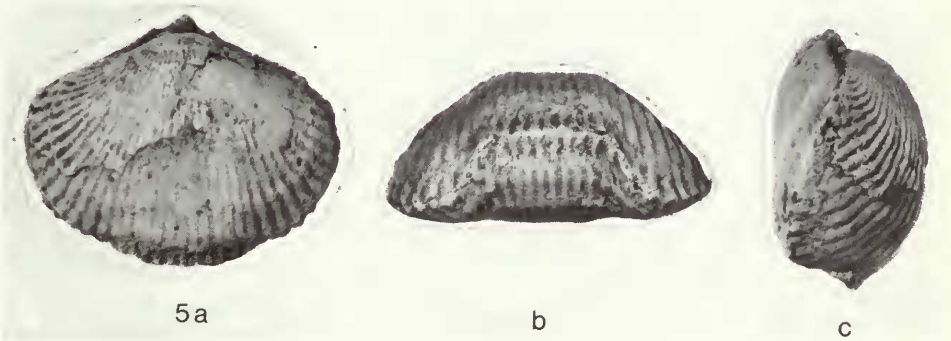


Fig. 5 *Cyclothyris africana* sp. nov., from the Upper Albian, Mzinene Formation, river cliff near Munywana Creek, northern Zululand. **Holotype.** a, dorsal view. b, anterior view. c, lateral view. ×2. Geological Survey of South Africa coll.

Internal characters. The transverse serial sections (Fig. 6) through a poorly-preserved but almost complete specimen confirm that the species belongs to the genus *Cyclothyris*.

The characteristic arrangement of the dorsally deflected hinge-plates, the concave surface of the distal ends of the crura and general transverse outline of the shell are similar to those of the Lower Albian *Cyclothyris deluci* (Pictet) from Perte-du-Rhône, France and its probable junior synonym *C. shenleyensis* (Walker) from Leighton Buzzard, Bedfordshire, England. It also bears a superficial resemblance to the subspecies *C. deluci clavelli* Calzada Badía, 1975, from the Lower Albian of Alcalá de Chivert, Spain. It differs from specimens assigned to *Cyclothyris antidichotoma* (Buvignier) from the Upper Aptian of Upware, Cambridge (Owen 1962 : 48, fig. 5) in having more persistent and less divergent dental lamellae and more acutely curved or dorsally deflected hinge plates.

NAME. 'African'.

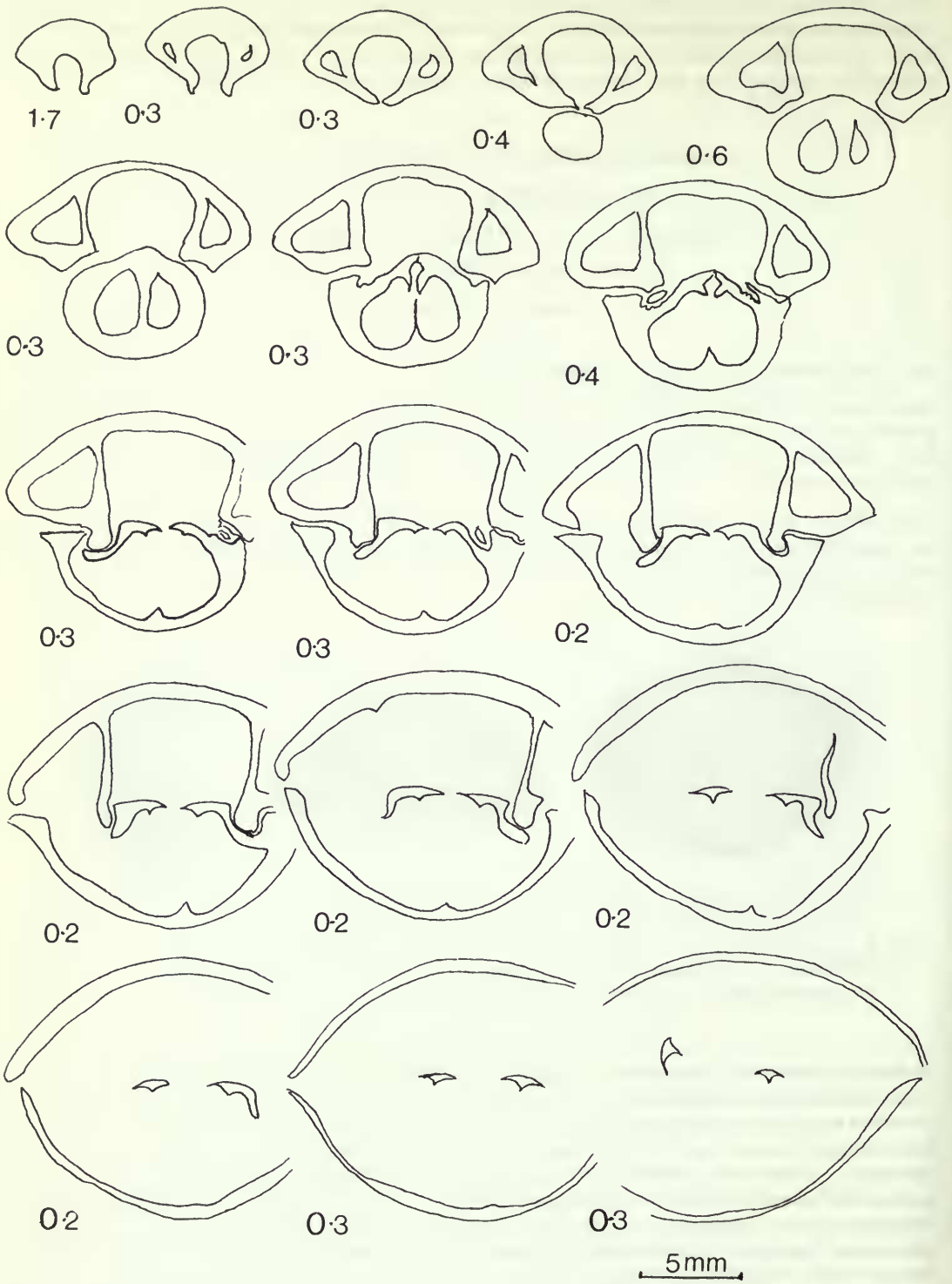


Fig. 6 *Cyclothyris africana* sp. nov. 17 transverse serial sections through a specimen from the Upper Albian, Mzinene Formation, river cliff near Munywana Creek, northern Zululand. ×3.

HOLOTYPE. The specimen figured here (Fig. 5), from the Upper Albian, Mzinene Formation, river cliff on south side of main southern tributary of Munywana Creek, 1·5 km ESE of the farm Izwehlia, northern Zululand (Loc. 64; Kennedy & Klinger 1975 : 289. See p. 275).

MATERIAL. Duplicate specimen from the type locality shown here in transverse serial section (Fig. 6), and two other specimens from the same locality and horizon.

REMARKS. *Cyclothyris africana* is closely related to the European species *C. deluci* from the Albian of Perte-du-Rhône, France. It may also have affinities with a form described and figured from the Upper Aptian (*jacobi* subzone) of Saltwood, near Folkestone, Kent (Owen 1960) as *C. deluci*, but now thought to be distinct.

Fabre (*in* Collignon 1950) described and figured a series of five rhynchonellids from Albian beds of Komihevitra, Madagascar. All five examples can be matched with specimens collected from beds of a similar age from northern Zululand. The specimen figured by Fabre (1950 : pl. 3, figs 11) is thought to belong to *C. africana*. It has similar general outline and costation, similar fold and sulcus and the same degree of inflation of the umbonal region of the brachial valve. It also bears a superficial resemblance to an incomplete rhynchonellid specimen from the ?Aptian–Albian beds of Sheik Budin, Pakistan, BB 18842 in the Department of Palaeontology, BM(NH).

Cyclothyris kennedyi sp. nov.
Fig. 7

DESCRIPTION. Robust, biconvex *Cyclothyris*, more circular in general outline than *C. africana* and with 18–20 coarse, well-incised radiating costae showing well-marked transverse lamellar growth-lines thickening at the shell margins. The hinge-line is broad or slightly extended, with

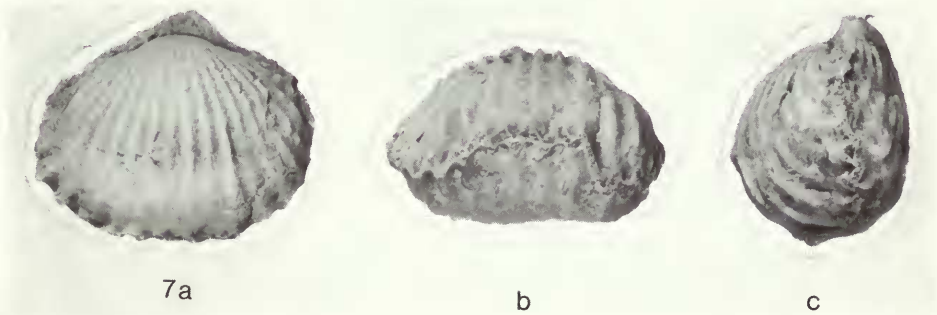


Fig. 7 *Cyclothyris kennedyi* sp. nov., from the Upper Albian, Mzinene Formation, near Ndumu, northern Zululand. **Holotype.** a, dorsal view. b, anterior view. c, lateral view. ×2. Geological Survey of South Africa coll.

a comparatively wide triangular interarea, large circular foramen and sharp beak-ridges. The median fold on the brachial valve is not clearly defined but the anterior shows a low, shallow sulcation and short, arcuate, linguiform extension.

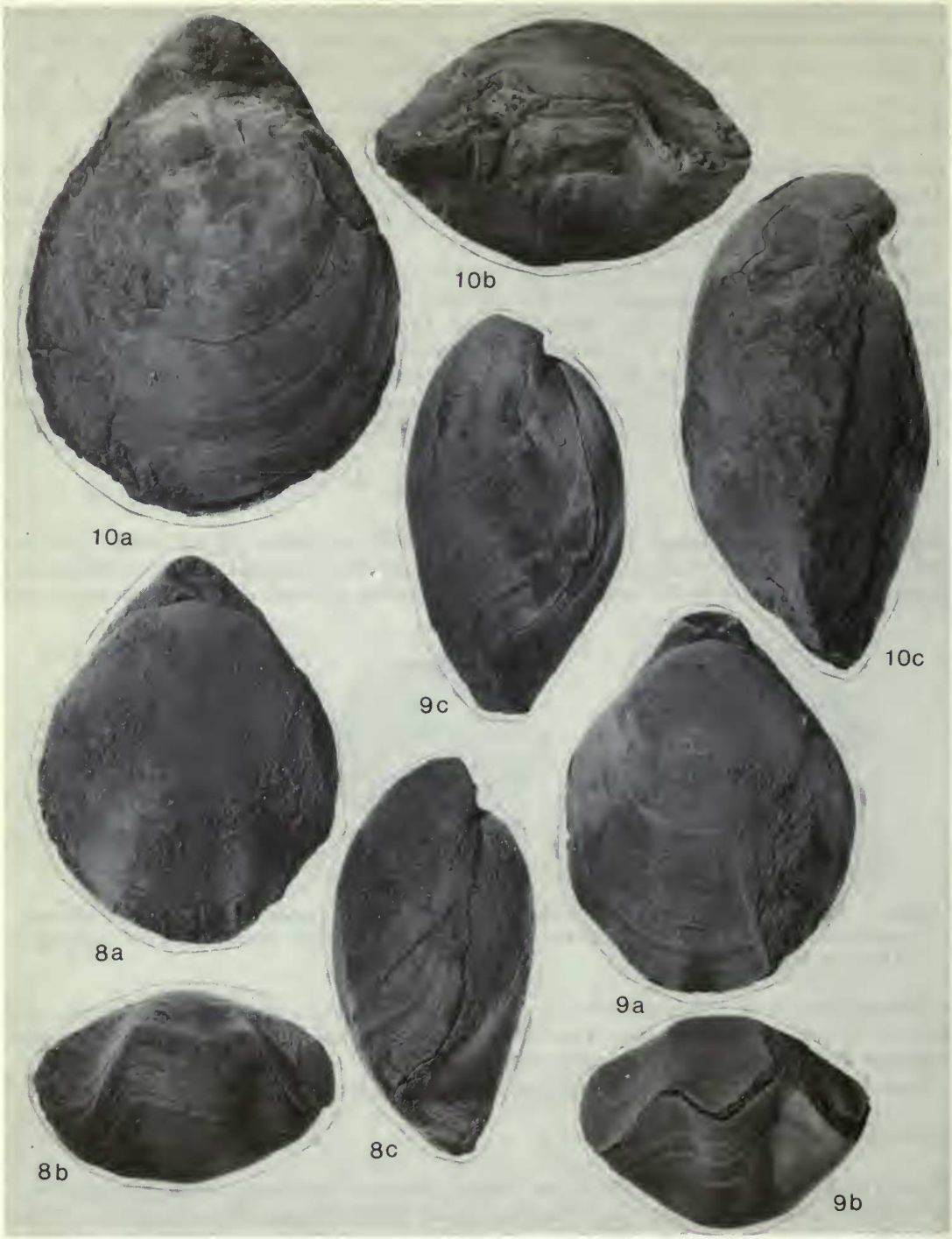
Internal characters. As for *Cyclothyris africana* sp. nov., p. 279.

NAME. For Dr W. J. Kennedy.

HOLOTYPE. From locality L.J.E.549, Upper Albian, Mzinene Formation, 5·5 km SE of the store at Ndumu, northern Zululand. In the collections of the Geological Survey of South Africa, Pretoria.

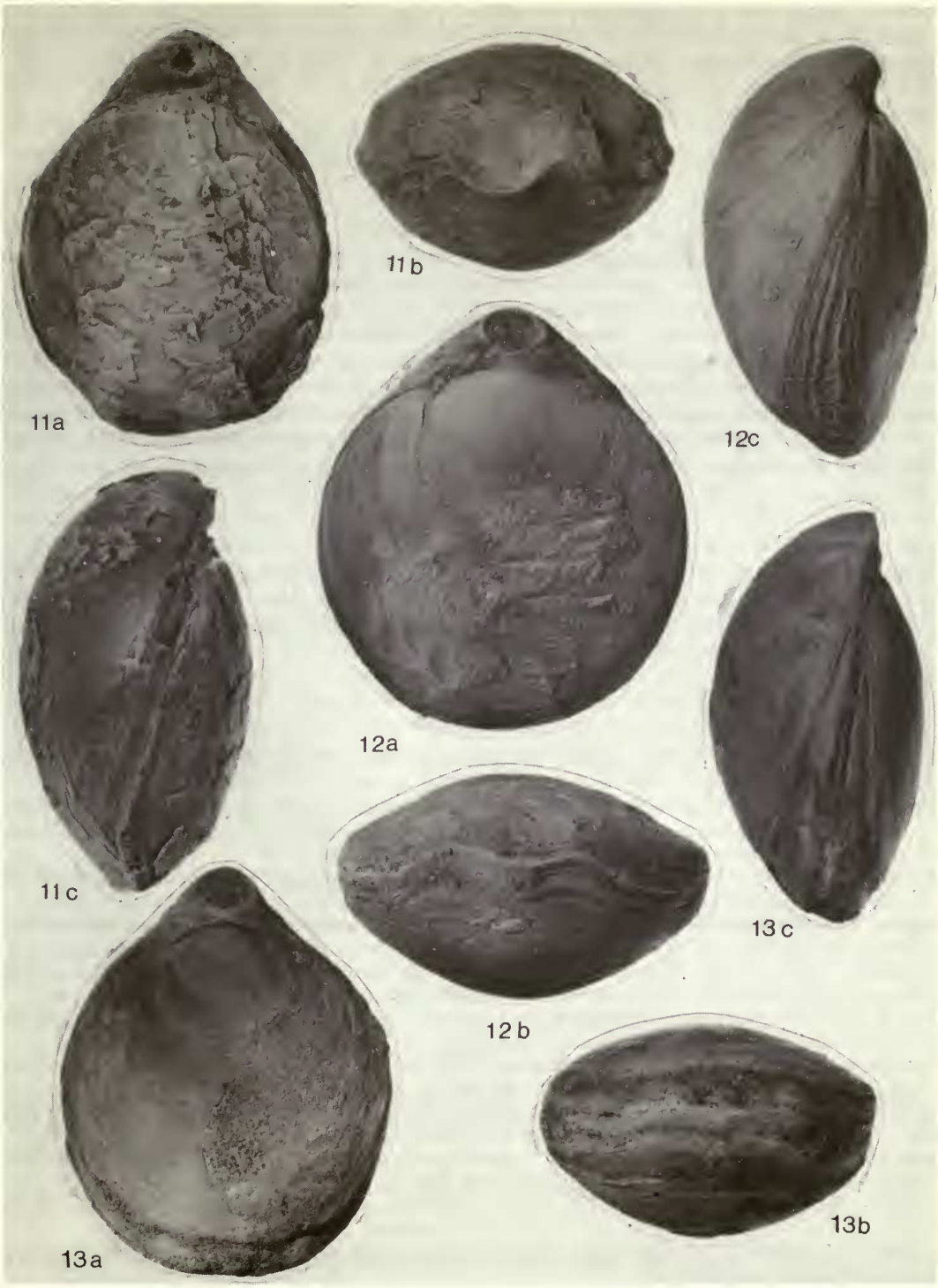
MATERIAL. A further seven specimens from the same locality and horizon.

REMARKS. Once again the species described here as *Cyclothyris kennedyi* strongly resembles a form which occurs in the Albian beds of Madagascar. Fabre (*in* Collignon 1950 : pl. 3, figs 8, 8a)



Figs 8, 9 *Praelongithyris vanhoepeni* (Lang). Figs 8a–c, BB 81006; Figs 9a–c, BB 81004. Both BM(NH) coll., from the Upper Albian, river cliff on south side of main southern tributary of Munywana Creek, northern Zululand. All ×2.

Fig. 10 *Cyrtothyris ndumuensis* sp. nov., from the Upper Albian, Mzinene Formation, Mzinene Pan, northern Zululand. This specimen is considered to be a variant of the species. a, dorsal view. b, anterior view. c, lateral view. ×2. Geological Survey of South Africa coll.



Figs 11–13 *Cyrtothyris ndumuensis* sp. nov., from the Upper Albian, Mzinene Formation, SE of store at Ndumu, northern Zululand. Figs 11a–c, **Holotype.** a, dorsal views. b, anterior views. c, lateral views. All ×2. Geological Survey of South Africa coll.

described and figured a specimen as *Rhynchonella* cf. *polygona* d'Orbigny which agrees with *C. kennedyi* in outline, costation and convexity. Three other specimens shown on the same plate may also be synonyms of *C. kennedyi*; they are named by Fabre as *Rhynchonella sulcata* Dav. (figs 9, 9a–b), *Rhynchonella sulcata* var. *salazacensis* Jacob & Fallot (figs 10, 10a–c) and *Rhynchonella deluci* Pictet (figs 12, 12a–c).

Conclusions

It is generally acknowledged by molluscan workers and others that a strong link appears to exist between the continent of Africa, Madagascar and parts of western Asia in the Aptian and Albian. The additional information from the brachiopod faunas strengthens the link and enlarges our view of the ubiquity of some brachiopod genera and species within a comparatively short time-span. It would be interesting to trace the occurrence of these related faunas still further. As yet the brachiopod facies faunas of the Aptian–Albian of Pakistan and the NW Caucasus are almost unknown and their relationship to similar faunas from central and eastern Europe remains speculative. However, more light is beginning to dawn upon these problems with our greater understanding of internal structures arising from the wider use of transverse serial sections, which tends to broaden our ideas on synonymies.

Acknowledgements

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